

T. A. EDISON.  
PROCESS OF MAKING PHONOGRAPH RECORDS.  
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1,078,265.

Patented Nov. 11, 1913.



*Witnesses:*  
Frank Lewis  
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# UNITED STATES PATENT OFFICE.

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## PROCESS OF MAKING PHONOGRAPH-RECORDS.

1,078,265.

Specification of Letters Patent.

Patented Nov. 11, 1913.

Application filed October 14, 1908. Serial No. 457,593.

*To all whom it may concern:*

Be it known that I, THOMAS ALVA EDISON, a citizen of the United States, and a resident of Llewellyn Park, Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Making Phonograph-Records, of which the following is a description.

10 The wax-like compositions now in common use for making phonograph records, such, for example, as that described in Patent No. 782,375, granted to Jonas W. Aylsworth, have qualities which make them  
15 specially adapted for this purpose. Such materials can be readily molded, give an accurate copy of the surface of the mold or matrix, and after being molded can be reamed out and trimmed off and otherwise  
20 worked with great facility. Phonograph records can be made from these materials at low cost, with simple machinery and by very cheap labor. It is a fact, however, that records made from these wax-like compositions  
25 and made as is now the common practice, with substantially one hundred record grooves to the inch, after being subjected to a large number of reproductions on the phonograph, show signs of wear and the  
30 character of the reproduction obtained therefrom is not so good as at first. Obviously, such records would be more rapidly worn if a narrower record groove and a reproducing stylus of correspondingly decreased size are made use of. As it is desirable to increase the amount of record on the surface, it is necessary that such surface should be hardened. It is desirable, therefore, that a record be made which will have  
40 a harder and tougher wearing surface and which will at the same time retain the good moldable and workable qualities of the records made from the wax-like compositions now used.

45 The object of my invention is to produce a record of the sort just described, from wax or wax-like composition, or other easily molded material, and having a hardened wearing surface.

50 In the practice of my invention I preferably take a duplicate or original phonograph record, which has been made in any of the usual ways from the usual wax-like composition, and immerse it in a solution of  
55 nitrated cotton in any of the ordinary sol-

vents used for this purpose, as for example, acetate of amyl, which is commonly made use of for providing a liquid solution from which films are made for photographic use. I may, if desired, add a small percentage of camphor to the nitrated cotton, thus making a celluloid collodion solution, but this may be dispensed with.

I place the record upon a dipping mandrel having adjustable extension ends at each end of the record. It is then immersed in the solution while held vertically; it is then withdrawn and subjected to a gentle breeze from a fan—to slightly affect or harden the surface; it is then immersed a second time and subjected to the air. If the solution is rather thick, two such dips will give a sufficient thickness of film over the record when the latter is dried. Sometimes it is best to make the solution thinner when three or more dips will be necessary. After the dips, the mandrel is transferred to a machine which rotates it in a horizontal position until nearly free from solvent, when it may be taken off the mandrel and set aside until the whole of the solvent has evaporated, leaving a very hard tough film on the surface of the record.

It is a remarkable fact, and entirely unexpected, that although the average depth of the indentations on a record is only half of one thousandth of an inch and the greatest depth one thousandth of an inch, yet, if the thickness of the film of the nitro-cellulose when dry is three thousandths of an inch, a perfect replica of the record underneath is produced on the surface of the cellulose above, even to the finest detail, and what is more strange is that the depth of the wave is so little affected that the loss in the volume of sound is scarcely noticeable.

Very deep records can be made and the reproducing balls can be pressed with sufficient force against the cellulose as to cause it to follow the record without injury to it, which would be impossible if the ball was forced against the record surface below. Thus, the volume and quality of the sound can be increased, and the sound record can be used indefinitely without noticeable deterioration.

Other film producing liquids may be used in place of the nitro-cellulose and its solvents, such as acetyl-cellulose in acetic acid. If the acetyl-cellulose is used in its usual

solvent—chloroform—the solvent will generally attack wax, and therefore the original record should be made of material which is not appreciably dissolved by the solvent of the film material. Water soluble film producing substances can be used, such as silicate of soda, but in this case the surface of the record should be capable of being wet evenly, as for instance, by immersing the wax record in weak alcohol and rapidly drying. This destroys the shiny appearance of the surface of the record without hurting the record itself. Upon immersion in silicate of soda, it will adhere evenly, and upon drying will give a hard film. This can be made harder by immersion in chlorid of calcium to form by double decomposition, calcium silicate. The silicate film is not so desirable as the cellulose film, not having toughness to withstand hard usage, although very desirable in view of the cheapness of the material.

The adhesion of the film to the record is very great as it is shrunk under great tension, and notwithstanding long use of the reproducing ball, it persists in its adhesion to the contour of the sound record. The thickness of the film may be governed by regulating the strength of the solution, a very dilute solution producing a thin film, as will be understood, and a stronger solution a thicker film. The film must obviously not be thick enough to interfere with the volume of sound produced by the record.

It is evident that for cheapening the film, it may be adulterated with various cheaper materials soluble in the solvent and which do not diminish beyond the desirable point. Attention is hereby directed to the accompanying drawing forming part of this

specification and illustrating diagrammatically the preferred steps of the process described and claimed.

Having now described my invention, what I claim is:

1. The process of imparting a surface hardening to a phonograph record of wax-like material having vertical sound undulations on the outer surface thereof, which consists in immersing the record in a solution of organic material, withdrawing the same from the solution and partially evaporating the solvent therefrom, then again immersing the same in said solution, withdrawing the same, and completely evaporating the solvent therefrom to produce on the record surface thereof a film containing on its outer surface a replica of the record underneath, substantially as set forth.

2. The process of imparting a surface hardening to a phonograph record of wax-like material having vertical sound undulations on the outer surface thereof, which consists in immersing the record in a solution of organic material, withdrawing the same from the solution and partially evaporating the solvent therefrom, then again immersing the same in said solution, withdrawing the same, and rotating the same to completely evaporate the solvent therefrom and to produce on the record surface thereof a film containing on its outer surface a replica of the record underneath, substantially as set forth.

This specification signed and witnessed this 10th day of October 1908.

THOS. A. EDISON.

Witnesses:

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FRANK D. LEWIS.